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## Math 135: Discrete Mathematics, Fall 2012

### Homework 3

Due *in class* on Friday, Sept. 21, 2010

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1. Find two sets  $A$  and  $B$  such that  $A \in B$  and  $A \subseteq B$ .
  
2. Give the following sets, if  $A = \{1, 2, (x, y)\}$ ,  $B = \{b, c, \{2, 3\}\}$ , and  $C = \{1, a, (1, b), (2, c), (x, y)\}$ . (Recall that  $\mathcal{P}(X)$  is the power set of  $X$ .)
  - (a)  $\mathcal{P}(B)$
  - (b)  $(A \times B) - C$
  - (c)  $\mathcal{P}(\mathcal{P}(\emptyset)) \times (A \cap C)$
  
3. Prove or disprove the following:
  - (a)  $A \times (B \cup C) = (A \times B) \cup (A \times C)$
  - (b)  $(A - C) \cap (C - B) = \emptyset$
  - (c) If  $\mathcal{P}(A) = \mathcal{P}(B)$ , then  $A = B$ .
  - (d) If  $A \cap C = B \cap C$ , then  $A = B$ .
  
4.
  - (a) Prove that for any two sets  $A$  and  $B$ ,  $\mathcal{P}(A) \cup \mathcal{P}(B) \subseteq \mathcal{P}(A \cup B)$ .
  - (b) Give a counterexample for the following statement: if  $A$  and  $B$  are sets, then  $\mathcal{P}(A) \cup \mathcal{P}(B) = \mathcal{P}(A \cup B)$ .